REMARKS

The foregoing amendments are responsive to the March 26, 2007 Office Action. Applicant respectfully request reconsideration of the present application in view of the foregoing amendments and the following remarks.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Response to Rejection of Claim 21 Under 35 U.S.C. 112, second paragraph

The Examiner rejected Claim 21 under 35 U.S.C. 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 21 has been amended to correct the antecedent basis issues identified by the Examiner.

Response to Rejection of Claims 1-24 Under 35 U.S.C. 101

The Examiner rejected Claims 1-24 under 35 U.S.C. 101 because the inventions as disclosed in claims are directed to non-statutory subject matter.

All of the claims recite a result that is useful, concrete, and tangible. Methods that produce results stored in a computer are statutory and patentable if they meet the other requirements for patentability. (*See, e.g.*, State Street Bank, 149 F.3d 1368 (Fed. Clr. 1998.)

Response to Rejection of Claim 1 Under Obviousness-Type Double Patenting

The Examiner rejected Claim 1 under nonstatutory obviousness-type double patenting as being unpatentable over Claim 1 of copending Application No. 09/676,727 in view of Canning et al., Rockwell Inst. Sci. Center, "Fast Direct Solution of Standard Moment-Method Matrices," IEEE Antennas and Propagation Magazine, June 1998, pages 15-26.

Applicant assumes this is a provisional rejection since the claims are not in final form. Applicant will timely file a terminal disclaimer should the provisional rejection be sustained once agreement is reached on the claims.

Response to Rejection of Claims 1-4, 6-11, and 13-24 Under 35 U.S.C. 102(b)

The Examiner rejected Claims 1-4, 6-11, and 13-24 under 35 U.S.C. 102(b) as being anticipated by Canning et al., Rockwell Inst. Sci. Center, "Fast Direct Solution of Standard Moment-Method Matrices," IEEE Antennas and Propagation Magazine, June 1998, pages 15-26, hereinafter referred to as Rockwell.

Argument (4)

In Section 11-4 of the Office Action, the Examiner labels one of Applicant's arguments from his response of December 21, 2006 as (4):

(4) "Rockwell does not teach or suggest that a second set of basis and a second set of weighting functions are to be obtained by separate rank reductions." (page 11, the last second paragraph, Amendment).

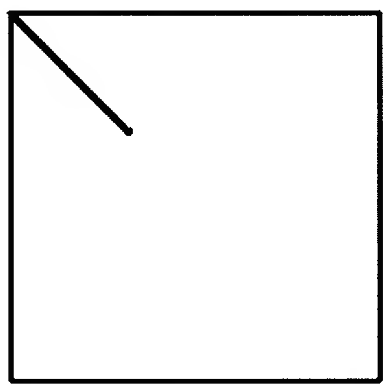
In Section 12-4 of the Office Action, the Examiner states: "Applicant's argument (4) is not persuasive… . Accordingly, Applicant admitted the matrix method used to find composite sources and composite testers can be a rank-revealing factorization such as…If one of ordinary skilled in the art cannot apply Rockwell's teaching to practice the claimed limitations of reducing matrix rank a potential enablement issue may be raised."

Applicant understands Examiner's response to mean that if Rockwell used a rank revealing factorization and Claim 1 recites reducing a rank, then the methods used must be the same. Applicant respectfully requests the Examiner to clarify the rejection, as the Examiner's analysis does not appear to fully address all limitations of the claimed method. As explained in Applicant's previous arguments: In Rockwell, the basis and testing functions are not computed independently. In Rockwell, Equation (4) on Page 17 shows a method for compressing a sub-matrix **A**. Using **A**, a pair of interdependent basis functions and testing functions computed using a single rank reduction and these interdependent basis and testing functions were then used together to compress exactly **A**. These interdependent basis and testing functions were not computed from different rank reductions as recited in Claim 1. By contrast, Claim 1 recites computing composite sources using a first rank reduction and composite testers using a second rank reduction.

The difference between the interdependent basis and testing functions of Rockwell and the composite basis and testing functions of the present invention has several consequences. For example, when a block **A** is compressed by the method of Rockwell, it may then be written as

$$\mathbf{A} = \mathbf{U}\,\mathbf{D}\,\mathbf{V}^h$$

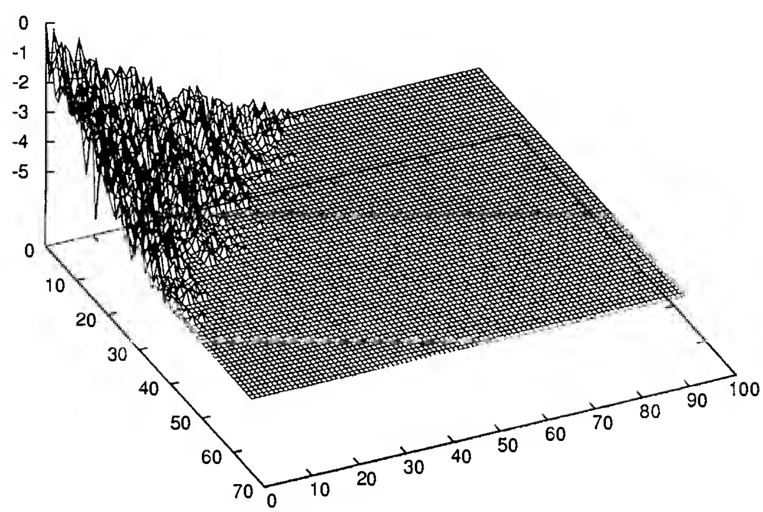
Here **D** is a diagonal matrix meaning that all non-diagonal elements of **D** are zero. Often, some of the diagonal elements are small and they may be approximated by zero. Thus, using Rockwell one may obtain a matrix **D** with the structure



In contrast to Rockwell, the present application teaches embodiments that use certain data to produce composite sources and that uses certain data to produce composite testers, and it teaches that the composite testers may (in these embodiments) be produced independently from the composite sources. This allows embodiments where a block $\mathbf{Z}_{p,q}$ of an interaction matrix may be written (using notation from paragraphs [0112] and [0124] of the published application or the third paragraph on Page 27 and the second paragraph on Page 29 of the Application as filed)

$$\mathbf{T}_{p,q} = \mathbf{d}_p^{L}\,\mathbf{Z}_{p,q}\,\mathbf{d}_q^{R}$$

An example of the structure one might find for $\mathbf{T}_{p,q}$ was shown in Figure 12 of the application:



In this example, $\mathbf{T}_{p,q}$ has a very different structure from the diagonal matrix of Rockwell. Prior art did not teach or suggest that the separately created composite basis functions and composite testing functions would create a sparse $\mathbf{T}_{p,q}$. In addition, the present invention teaches a number of advantages of the ability to independently create composite sources and / or composite testers. These advantages include improved sparseness and improved methods for computing a decomposition.

The present application also teaches other differences from Rockwell. In Rockwell, a block **A** of interaction data was compressed by a singular value decomposition of exactly **A**, which produced new basis and testing functions which had to be used together to describe exactly **A**. The present application teaches not only finding composite basis and testing functions separately. It also teaches methods for choosing/computing data other than A to be used in computing composite basis and/or testing functions. For example, it teaches how to use a relatively small amount data to produce composite sources or testers used to compress a relatively larger block of interaction data One such embodiment describes this in paragraphs

[109] and [110] of the published application or in the last two paragraphs on Page 26 of the application as filed.

Regarding Claim 1, Rockwell does not teach or render obvious, separate rank reductions

Regarding Claims 2 and 9, the present invention provides the ability to create a sparse matrix rather than merely a sparse representation of a matrix. In the present Office Action in 12-7 on page 18 the Examiner noted, "...a sparse representation of Z is obtained as disclosed by Rockwell at page 16." Applicant notes that on page 16 of Rockwell, the expression "sparse representation" is used eight times, and the expressions "sparse manner", "sparse storage", and "sparse description" also occur. However, it is notable that this publication avoids saying that Z or related matrices were actually sparse. The sparse representation described by Rockwell may be illustrated by the figure below.

$U_{11}D_{11}V^h_{11}$	$U_{12}D_{12}V^h_{12}$	$U_{13}D_{13}V^h_{13}$	$U_{14}D_{14}V^h_{14}$	$U_{15}D_{15}V^h_{15}$
$U_{21}D_{21}V^h_{21}$	$U_{22}D_{22}V^h_{22}$	$U_{23}D_{23}V^h_{23}$	$U_{24}D_{24}V^h_{24}$	$U_{25}D_{25}V^h_{25}$
$U_{31}D_{31}V^h_{31}$	$U_{32}D_{32}V^h_{32}$	$U_{33}D_{33}V^h_{33}$	$U_{34}D_{34}V^h_{34}$	$U_{35}D_{35}V^h_{35}$
$U_{41}D_{41}V^h_{41}$	$U_{42}D_{42}V^h_{42}$	$U_{43}D_{43}V^h_{43}$	$U_{44}D_{44}V^h_{44}$	$U_{45}D_{45}V^h_{45}$
$U_{51}D_{51}V^h_{51}$	$U_{52}D_{52}V^h_{52}$	$U_{53}D_{53}V^h_{53}$	$U_{54}D_{54}V^h_{54}$	$U_{55}D_{55}V^h_{55}$

This figure shows a compressed form of a matrix Z, where each block is separately compressed. The compression method taught by Rockwell did not produce a sparse matrix to represent Z. Rather, it created a sparse representation of Z. Rockwell taught using an SVD on each Block (p,q) of Z, $Z_{p,q}$, and then replacing that block by a representation using $U_{p,q}$, $D_{p,q}$, and $V_{p,q}$. When some of the diagonal elements of $D_{p,q}$, are approximated by zero, only some of the columns of $U_{p,q}$ and of $V_{p,q}$ are used, providing a compressed representation. This is also called a sparse representation of that block. In contrast, Claims 2 and 9 discuss zero elements in an interaction matrix and discuss a block-sparse matrix respectively.

Regarding Claim 21, the method of Rockwell created a decomposition in which the sparse representation of a block used composite basis functions from different rank reductions. On page 22 of Rockwell, second column, second to the last paragraph, it states:

> "Within **L** the 'u's are always identical to the 'u's in **Z**. However, the 'v's in **L** are different from the 'v's in **Z**, and must be calculated as shown above. Also, there are 'f' vectors necessary in **L** that do not occur in **Z**."

Equation (36) on Page 22 of Rockwell states:

$$A2 = u_2\, v_2^h - u_1[3\text{-}4]f_2^h$$

This sparse representation of Block two of the decomposition uses u_2 from an SVD on Block two of **Z** and u_1 from an SVD on Block one of **Z** and uses f_2 which is calculated using Equations (32) and (36). In contrast, Claim 21 recites, "said second sub-matrices corresponding to composite sources produced by reducing a rank of a first matrix of transmitted disturbances".

Regarding Claims 22 and 23, in Rockwell, the block **A** was used in an SVD only to compress exactly **A**. That is, the plurality of disturbances was the same as the data to be compressed. The present application teaches that data other than that in a block **A** may be used to compress block **A**.

Claim 22 recites, "and wherein said plurality of far-field disturbances is partially described by said interaction data."

Claim 23 recites, "said plurality of disturbances do not describe interactions described by said portion."

Applicant asserts that Claims 1-4, 6-11, and 13-24 are directed to statutory subject matter and allowable over the prior art. Accordingly, Applicant respectfully requests allowance of Claims 1-4, 6-11, and 13-24.

Response to Rejection of Claims 5 and 12 Under 35 U.S.C. 103(a)

The Examiner rejected Claims 5 and 12 under 35 U.S.C. 103(a) as being unpatentable over Canning et al., Rockwell Inst. Sci. Center, "Fast Direct Solution of Standard Moment-Method Matrices," IEEE Antennas and Propagation Magazine, June 1998, pages 15-26 in view of Applicant's assertion..

Regarding Claim 5, the cited prior art does not make obvious a method for factorization of an interaction matrix in Claim 2.

Regarding Claim 12, the cited prior art does not make obvious the use of LDM decomposition in connection with the other elements of Claim 9.

Applicant asserts that Claims 5 and 12 are directed to statutory subject matter and allowable over the prior art. Accordingly, Applicant respectfully requests allowance of Claims 5 and 12.

Summary

Applicant respectfully assert that Claims 1-24 are allowable over the prior art, and Applicant request allowance of Claims 1-24. If there are any remaining issues that can be resolved by a telephone conference, the Examiner is invited to call the undersigned attorney at (949) 721-6305 or at the number listed below.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: May 29, 2007

By: [signature]

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